Interview Summary	Application No. 10/757,926	Applicant(s) TRACHEWSKY ET AL.	
	Examiner Leon Flores	Art Unit 2611	

All participants (applicant, applicant's representative, PTO personnel):

(1) Leon Flores. (3)_____.

(2) Kevin L. Smith. (4)_____.

Date of Interview: 9/20/2007.

Type: a)☒ Telephonic b)☐ Video Conference
c)☐ Personal [copy given to: 1)☐ applicant 2)☐ applicant's representative]

Exhibit shown or demonstration conducted: d)☐ Yes e)☒ No.
If Yes, brief description: _____.

Claim(s) discussed: 17-32.

Identification of prior art discussed: _____.

Agreement with respect to the claims f)☐ was reached. g)☐ was not reached. h)☒ N/A.

Substance of Interview including description of the general nature of what was agreed to if an agreement was reached, or any other comments: See attachment.

(A fuller description, if necessary, and a copy of the amendments which the examiner agreed would render the claims allowable, if available, must be attached. Also, where no copy of the amendments that would render the claims allowable is available, a summary thereof must be attached.)

THE FORMAL WRITTEN REPLY TO THE LAST OFFICE ACTION MUST INCLUDE THE SUBSTANCE OF THE INTERVIEW. (See MPEP Section 713.04). If a reply to the last Office action has already been filed, APPLICANT IS GIVEN A NON-EXTENDABLE PERIOD OF THE LONGER OF ONE MONTH OR THIRTY DAYS FROM THIS INTERVIEW DATE, OR THE MAILING DATE OF THIS INTERVIEW SUMMARY FORM, WHICHEVER IS LATER, TO FILE A STATEMENT OF THE SUBSTANCE OF THE INTERVIEW. See Summary of Record of Interview requirements on reverse side or on attached sheet.

Examiner Note: You must sign this form unless it is an Attachment to a signed Office action.

Examiner's signature, if required

IN THE CLAIMS

Please amend the claims as follows, substituting any amended claim(s) for the corresponding pending claim(s):

1. (Original) A radio frequency integrated circuit (RFIC) comprises:

transmitter section operably coupled to convert outbound baseband signals into outbound radio frequency (RF) signals;

receiver section operably coupled to convert inbound RF signals into inbound baseband signals, wherein the receiver section includes: a low noise amplifier operably coupled to amplify the inbound RF signals to produce amplified inbound RF signals;

down-conversion module operably coupled to convert the amplified inbound RF signals into baseband in-phase components and quadrature components;

orthogonal-normalizing module operably coupled to:

obtain a first coefficient that is based on at least one of power of the baseband in-phase components, power of the baseband quadrature components, and cross-correlation between the baseband in-phase components and the baseband quadrature components;

obtain a second coefficient that is based on at least one of the power of the baseband in-phase components, the power of the baseband quadrature components, and the cross-correlation between the baseband in-phase components and the baseband quadrature components;

normalize an orthogonal relationship between the baseband in-phase components and the baseband quadrature components based on the first coefficient and the second coefficient to produce normalized in-phase components and normalized quadrature components; and

baseband processor operably coupled to recapture data from the normalized in-phase and quadrature components.

2. (Original) The RFIC of claim 1, wherein the orthogonal-normalizing module comprises:

a first multiplier module operably coupled to multiple the baseband in-phase components with the first coefficient to produce the normalized in-phase components;

a second multiplier module operably coupled to multiple the baseband in-phase components with the second coefficient to produce the cross-correlation; and

a subtraction module operably coupled to subtract the cross-correlation from the baseband quadrature components to produce the normalized quadrature components.

3. (Original) The RFIC of claim 2, wherein the first multiplier module comprises: a first plurality of shift registers operably coupled to produce a plurality of shifted representations of the baseband in-phase components; switch matrix operably coupled to pass selected ones of the plurality of shifted representations of the baseband in-phase components and the baseband in-phase components based on the first coefficient; and an adder operably coupled to add the selected ones of the plurality of shifted representations of the baseband in-phase components and the baseband in-phase components to produce the normalized in-phase components.

4. (Original) The RFIC of claim 2, wherein the second multiplier module comprises: a first plurality of shift registers operably coupled to produce a plurality of shifted representations of the baseband in-phase components; switch matrix operably coupled to pass selected ones of the plurality of shifted representations of the baseband in-phase components based on the second coefficient; and an adder operably coupled to add the selected ones of the plurality of shifted representations of the baseband in-phase components to produce the cross-correlation.

5. (Original) The RFIC of claim 1, wherein the orthogonal-normalizing module comprises: a first multiplier module operably coupled to multiply the baseband in-phase components with the second coefficient to produce the cross-correlation; a subtraction module operably coupled to subtract the cross-correlation from the baseband quadrature components to produce phase adjusted quadrature components; and a second multiplier module operably coupled to multiply the phase adjusted quadrature components with the first coefficient to produce the normalized quadrature components, wherein the baseband in-phase components are passed as the normalized in-phase components.

6. (Currently Amended) The RFIC of claim 1, wherein the orthogonal-normalizing module comprises: a first programmable register for storing the first coefficient; and a second programmable register for storing the second coefficient, wherein the first and second coefficients are determined by a ~~trail and error manufacturing test~~ <u>trial and error manufacturing test</u>.

7. (Original) The RFIC of claim 1, wherein the orthogonal-normalizing module comprises:

a full matrix multiply module operably coupled to multiply the baseband in-phase components and the baseband quadrature components with a coefficient matrix that includes the first and second coefficients to produce the normalized in-phase components and the normalized quadrature components.

8. (Original) The RFIC of claim 1, wherein the orthogonal-normalizing module further functions to:

measure local oscillation leakage power to produce a first power measurement;

provide a first magnitude signal to an in-phase portion of the receiver section and a zero magnitude signal to a quadrature portion of the receiver section;

measure power of the in-phase portion and power of the quadrature portion while processing the first magnitude signal and the zero magnitude signal, respectively, to produce a second power measurement;

provide the first magnitude signal to the quadrature portion of the receiver section and the zero magnitude signal to the in-phase portion of the receiver section;

measure the power of the in-phase portion and the power of the quadrature portion while processing the zero magnitude signal and the first magnitude signal, respectively, to produce a third power measurement;

determine a gain imbalance based on the first, second, and third power measurements;

provide a second magnitude signal to the in-phase portion and to the quadrature portion;

measure the power of the in-phase and quadrature portions while processing the second magnitude signal to produce a fourth power measurement;

provide the second magnitude signal to the in-phase portion and a negative second magnitude signal to the quadrature portion;

measure the power of the in-phase portion and the power of the quadrature portion while processing the second magnitude signal and the negative second magnitude signal, respectively, to produce a fifth power measurement; and

determine a phase imbalance based on the first, fourth, and fifth power measurements, wherein the gain imbalance and the phase imbalance correspond to the power of the baseband in-phase components, the power of the baseband quadrature components, and the cross-correlation between the baseband in-phase components and the baseband quadrature components to determine the first and second coefficients.

9. (Original) The RFIC of claim 1, wherein the orthogonal-normalizing module further functions to obtain the first and second coefficients by:

measuring in-phase signal level of the receiver section while processing a sine wave;

measuring quadrature signal level of the receiver section while processing the sine wave;

determining the power of the baseband in-phase components based on the in-phase signal level;

determining the power of the baseband quadrature components based on the quadrature signal level;

determining cross-correlation power based on the in-phase signal level and the quadrature signal level; and

determining the first and second coefficients based on the power of the baseband in-phase components, the of the baseband quadrature components, and the cross-correlation power.

10. (Original) The RFIC of claim 1, wherein the orthogonal-normalizing module normalizes the orthogonal relationship between the baseband in-phase components and the baseband quadrature components by:

selecting one of the baseband in-phase components and the baseband quadrature components as a reference component; and

normalizing another one of the baseband in-phase components and the baseband quadrature components to the reference component.

11. (Original) The RFIC of claim 1, wherein the orthogonal-normalizing module further functions to: update the first and second coefficients to compensate for at least one of temperature variation and aging.

Claims 12-16. (Cancelled)

17. (Currently Amended) A radio frequency integrated circuit (RFIC) comprises:

receiver section operably coupled to convert inbound radio frequency (RF) signals into inbound baseband signals;

transmitter section operably coupled to convert outbound data into outbound RF signals, wherein the transmitter section includes:

baseband processor operably coupled to convert the outbound data into the baseband in-phase components and baseband quadrature components;

orthogonal-normalizing module operably coupled to:

obtain a first coefficient that is based on at least one of a gain imbalance and phase imbalance;

obtain a second coefficient that is based on at least one of the gain imbalance and the phase imbalance;

normalize an orthogonal relationship between the baseband in-phase components and the baseband quadrature components based on the first coefficient and the second coefficient to produce normalized in-phase components and normalized quadrature components;

up-conversion module operably coupled to convert the normalized in-phase components and normalized quadrature components into RF signals; and

power amplifier operably coupled to amplify the RF signals to produce the outbound RF signals;

wherein the orthogonal-normalizing module includes:

a first multiplier module operably coupled to multiple the baseband in-phase components with the first coefficient to produce the normalized in-phase components, the first multiplier module includes:

a first plurality of shift registers operably coupled to produce a plurality of shifted representations of the baseband in-phase components;

switch matrix operably coupled to pass selected ones of the plurality of shifted representations of the baseband in-phase components and the baseband in-phase components based on the first coefficient; and

an adder operably coupled to add the selected ones of the plurality of shifted representations of the baseband in-phase components and the baseband in-phase components to produce the normalized in-phase components;

a second multiplier module operably coupled to multiple the baseband in-phase components with the second coefficient to produce cross coupled in-phase components; and

a subtraction module operably coupled to subtract the cross coupled in-phase components from the baseband quadrature components to produce the normalized quadrature components.

Claims 18-19. (Cancelled).

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20. (Original) The RFIC of claim 18, wherein the second multiplier module comprises:

a first plurality of shift registers operably coupled to produce a plurality of shifted representations of the baseband in-phase components;

switch matrix operably coupled to pass selected ones of the plurality of shifted representations of the baseband in-phase components based on the second coefficient; and

an adder operably coupled to add the selected ones of the plurality of shifted representations of the baseband in-phase components to produce the cross coupled in-phase components.

Claims 21-23. (Cancelled)

24. (Original) The RFIC of claim 17, wherein the orthogonal-normalizing module further functions to:

measure local oscillation leakage power to produce a first power measurement;

provide a first magnitude signal to an in-phase portion of the transmitter section and a zero magnitude signal to a quadrature portion of the transmitter section;

measure power of the in-phase portion and power of the quadrature portion while processing the first magnitude signal and the zero magnitude signal, respectively, to produce a second power measurement;

provide the first magnitude signal to the quadrature portion of the transmitter section and the zero magnitude signal to the in-phase portion of the transmitter section;

measure the power of the in-phase portion and the power of the quadrature portion while processing the zero magnitude signal and the first magnitude signal, respectively, to produce a third power measurement;

determine the gain imbalance based on the first, second, and third power measurements;

provide a second magnitude signal to the in-phase portion and to the quadrature portion;

measure the power of the in-phase and quadrature portions while processing the second magnitude signal to produce a fourth power measurement;

provide the second magnitude signal to the in-phase portion and a negative second magnitude signal to the quadrature portion;

measure the power of the in-phase portion and the power of the quadrature portion while processing the second magnitude signal and the negative second magnitude signal, respectively, to produce a fifth power measurement; and

determine the phase imbalance based on the first, fourth, and fifth power measurements.

25. (Original) The RFIC of claim 17, wherein the orthogonal-normalizing module normalizes the orthogonal relationship between the baseband in-phase components and the baseband quadrature components by:

selecting one of the baseband in-phase components and the baseband quadrature components as a reference component; and

normalizing another one of the baseband in-phase components and the baseband quadrature components to the reference component.

26. (Original) The RFIC of claim 17, wherein the orthogonal-normalizing module further functions to:

update the first and second coefficients to compensate for at least one of temperature variation and aging.

Claims 27-32 (Cancelled)